

WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTER OF
PATENT OF THE UNITED STATES OF AMERICA IS:

1. A process for the preparation of alkylene glycols comprising reacting an alkylene oxide with water in the presence of a catalyst of the formula MA_x wherein M is a Group IIIB, rare earth metal, actinide or Group IVB cation, A is a non-coordinating or weakly coordinating anion and x is the valence of L.
2. The process of Claim 1 which additionally comprises reacting an alkylene oxide and with water in the presence of carbon dioxide.
3. The process of Claim 1 wherein the alkylene oxides are of the formula $R^1R^2(COC)R^3R^4$, where each R^1 , R^2 , R^3 and R^4 is independently hydrogen or an alkyl of from 1 to 10 carbon atoms and the alkylene glycol is of the formula $R^1R^2(COHCOH)R^3R^4$.
4. The process of Claim 2 wherein the alkylene oxides are ethylene oxide, propylene oxide or butylene oxide.
5. The process of Claim 1 wherein the alkylene oxide is ethylene oxide and the alkylene glycol is ethylene glycol.
6. The process of Claim 1 wherein M is selected from the group consisting of scandium, yttrium, lanthanum, europium, ytterbium, and hafnium.
7. The process of Claim 6 wherein M is scandium.
8. The process of Claim 1 wherein A is selected from the group consisting of a trifluoromethane sulfonate or triflate ($[CF_3SO_3]^-$),

hexafluorophosphate ($[\text{PF}_6]^-$), $[\text{Al}[\text{OC}(\text{CF}_3)_3]_4]^-$, tetrafluoroborate ($[\text{BF}_4]^-$), perchlorate ($[\text{ClO}_4]^-$), teflate ($[\text{TeOF}_5]^-$), BArF ($[\text{B}(\text{ArH}_x\text{F}_y)_4]^-$ where Ar is an aryl and $x+y=5$), tosylate ($[\text{CH}_3\text{C}_6\text{H}_4\text{SO}_3]^-$), mesylate ($[\text{CH}_3\text{SO}_3]^-$) and antimonyhexafluoride ($[\text{SbF}_6]^-$).

9. The process of Claim 8 wherein A is a triflate.

10. The process of Claim 1 wherein the catalyst is scandium triflate $[\text{Sc}(\text{CF}_3\text{SO}_3)_3]$, europium triflate $[\text{Eu}(\text{CF}_3\text{SO}_3)_3]$, hafnium triflate $[\text{Hf}(\text{CF}_3\text{SO}_3)_4]$, yttrium triflate $[\text{Y}(\text{CF}_3\text{SO}_3)_3]$, lanthanum triflate $[\text{La}(\text{CF}_3\text{SO}_3)_3]$ or ytterbium triflate $[\text{Yb}(\text{CF}_3\text{SO}_3)_3]$.

11. The process of Claim 1 wherein the process is carried out at a temperature from about 20°C to 250°C .

12. The process of Claim 11 wherein the temperature is 50°C to 200°C .

13. The process of Claim 1 wherein the process is carried out at a pressure greater than atmospheric.

14. The process of Claim 13 wherein the pressure is 25 psig to 1000 psig.

15. The process of Claim 1 wherein the molar ratio of alkylene oxide to water is in the range from about 5 to 25.

16. The process of Claim 1 wherein the catalyst is homogeneous.

17. The process of Claim 1 wherein the catalyst is heterogeneous.

18. The process of Claim 17 wherein the catalyst is heterogenized on ion exchange resins, by microencapsulation or by being bond to a metal oxide surface.

19. A process for the preparation of alkylene glycols comprising reacting an alkylene oxide with water in the presence of a catalyst of the formula $M'B_x$ wherein M' is a Group IIIB, rare earth metal, actinide or Group IVB cation, B is a coordinating anion and x is the valence of M' .

20. The process of Claim 19 wherein M' is selected from the group consisting of scandium, yttrium, lanthanum, europium, ytterbium, and hafnium.

21. The process of Claim 20 wherein M' is scandium.

22. The process of Claim 19 wherein B is selected from the group consisting of nitrate ($[NO_3]^-$), sulfate ($[SO_4]^{2-}$), chloride ($[Cl]^-$) and acetate ($[CH_3COO]^-$)

23. The process of Claim 22 wherein B is a nitrate.

24. The process of Claim 19 wherein the catalyst is scandium sulfate $[Sc_2(SO_4)_3]$, scandium chloride $[ScCl_3]$, scandium acetate $[Sc(OAc)_3]$ and scandium nitrate $[Sc(NO_3)_3]$.

25. A process for the preparation of alkylene glycols comprising reacting an alkylene oxide with water in the presence of a catalyst of the formula $M''A_xB_y$ wherein M'' is a Group IIIB, rare earth metal, actinide or Group IVB cation, A is a non-coordinating

or weakly coordinating anion, B is a coordinating anion and $x+y$ equals the valence of M'' .

26. The process of Claim 1 wherein M'' is selected from the group consisting of scandium, yttrium, lanthanum, europium, ytterbium, and hafnium.

27. The process of Claim 26 wherein M'' is scandium.

28. The process of Claim 25 wherein A is selected from the group consisting of trifluoromethane sulfonate or triflate ($[\text{CF}_3\text{SO}_3]^-$), hexafluorophosphate ($[\text{PF}_6]^-$), $[\text{Al}[\text{OC}(\text{CF}_3)_3]_4]^-$, tetrafluoroborate ($[\text{BF}_4]^-$), perchlorate ($[\text{ClO}_4]^-$), teflate ($[\text{TeOF}_5]^-$), BArF ($[\text{B}(\text{ArH}_x\text{F}_y)_4]^-$ where Ar is an aryl and $x+y=5$), tosylate ($[\text{CH}_3\text{C}_6\text{H}_4\text{SO}_3]^-$), mesylate ($[\text{CH}_3\text{SO}_3]^-$) and antimonyhexafluoride ($[\text{SbF}_6]^-$).

29. The process of Claim 28 wherein A is a triflate.

30. The process of Claim 25 wherein B is selected from the group consisting of nitrate ($[\text{NO}_3]^-$), sulfate ($[\text{SO}_4]^{2-}$), chloride ($[\text{Cl}]^-$) and acetate ($[\text{CH}_3\text{COO}]^-$).

31. The process of Claim 30 wherein B is a nitrate.

32. The process of Claim 25 wherein the catalyst is scandium triflate sulfate $[\text{Sc}(\text{CF}_3\text{SO}_3)(\text{SO}_4)]$, scandium triflate chloride $[\text{Sc}(\text{CF}_3\text{SO}_3)_2\text{Cl}]$, scandium triflate acetate $[\text{Sc}(\text{CF}_3\text{SO}_3)_2(\text{OAc})_3]$ and scandium triflate nitrate $[\text{Sc}(\text{CF}_3\text{SO}_3)_2(\text{NO}_3)]$.